

WHAT WE CLAIM IS:

1. A projection optical apparatus, comprising:
a projection unit comprising a display device and
projection optical systems,
5 a concave mirror for projecting exit pupils of said
projection optical systems onto a given position, and
a diffusing plate located near to images projected
through said projection optical systems, wherein:
at least three such projection units are provided,
10 said projection optical systems magnify and projects
an image appearing on said display device, and
said diffusing plate has such a diffusion action
that said exit pupil images are each projected in an at
least partially overlapping fashion.
- 15 2. The projection optical apparatus according to
claim 1, wherein:
said diffusing plate is a transmission hologram.
3. The projection optical apparatus according to
claim 2, wherein:
20 said transmission hologram is located such that a
light ray from said display device to said exit pupils
transmits twice through said transmission hologram, and
further,
said transmission hologram is located such that an
25 angle of first transmission through said transmission
hologram is different from an angle of second transmission
through said transmission hologram.
4. The projection optical apparatus according to

claim 1, wherein:

said concave mirror comprises a Fresnel concave reflecting mirror.

5 5. The projection optical apparatus according to claim 1, wherein:

said diffusing plate has such a property that an angle of diffusion at full width half maximum is up to 20° .

10 6. The projection optical apparatus according to claim 1, wherein:

said diffusing plate has such a property that an angle of diffusion at a full width where light intensity becomes 1/10 is up to 40° .

15 7. The projection optical apparatus according to claim 1, wherein:

said projection units and said concave mirror are positioned such that axial chief rays from said projection optical systems in each projection unit are obliquely incident on said concave mirror.

20 8. The projection optical apparatus according to claim 2, wherein:

both zero-order light upon the first transmission through said transmission hologram and zero-order light upon the second transmission through said transmission
25 hologram pass through a position different from those of said exit pupil images.

9. The projection optical apparatus according to

claim 1, wherein:

said diffusing plate has a bending action by diffraction.

10. The projection optical apparatus according to
5 claim 1, which satisfies the following condition:

$$10^{\circ} < \gamma < 20^{\circ} \quad \dots (3)$$

where γ is an angle of bending of a d-line axial chief ray through said diffusing plate.

11. The projection optical apparatus according to
10 claim 1, which satisfies the following condition:

$$5^{\circ} < \beta < 20^{\circ} \quad \dots (4-1)$$

where β is an angle of incidence of a d-line axial chief ray on said concave mirror.

12. The projection optical apparatus according to
15 claim 1, which satisfies the following condition:

$$0.5 < \gamma/\beta < 2 \quad \dots (5)$$

where γ is an angle of bending of a d-line axial chief ray through said diffusing plate, and β is an angle of incidence of a d-line axial chief ray on said concave
20 mirror.

13. The projection optical apparatus according to claim 1, wherein:

the display devices in said projection units displays images of mutually different colors.

25 14. A stereoscopic viewing system, comprising:
a projection unit comprising a display device and projection optical systems,

a first projection member comprising at least three such projection units,

a second projection member comprising at least three such projection units,

5 a concave mirror for projecting an exit pupil of each of said projection optical systems onto a given position, and

a diffusing plate located near to an image projected through said first projection member and an image
10 projected through said second projection member, wherein:

said projection optical system magnifies and projects an image appearing on said display device,

said concave mirror projects an exit pupil of each of said projection optical systems in said first
15 projection member onto a first given position, and projects an exit pupil of each of the projection optical systems in said second projection member onto a second given position, and

said diffusing plate has such a diffusion action
20 that each of exit pupil images at said first given position is projected in an at least partially overlapping fashion and each of exit pupil images at said second given position is projected in an at least partially overlapping fashion.

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